

CONSERVATION PRACTICE STANDARD

GRASSED WATERWAY

(Acre)

CODE 412

DEFINITION

A natural or constructed channel that is shaped or graded to required dimensions and established with suitable vegetation.

PURPOSES

This practice may be applied as part of a conservation management system to support one or more of the following purposes:

- to convey runoff from terraces, diversions, or other water concentrations without causing erosion or flooding
- to reduce gully erosion
- to protect/improve water quality.

CONDITIONS WHERE PRACTICE APPLIES

In areas where added water conveyance capacity and vegetative protection are needed to control erosion resulting from concentrated runoff and where such control can be achieved by using this practice alone or combined with other conservation practices.

CRITERIA

General Criteria Applicable to All Purposes

Grassed waterways shall be planned, designed, and constructed to comply with all Federal, State, and local laws and regulations.

Capacity. The minimum capacity shall be that required to convey the peak runoff expected from a storm of 10-year frequency, 24-hour duration. If the waterway will receive flow from terraces, diversions, or other structures with a larger design storm, the waterway shall be designed for the same storm frequency and duration. When the waterway

slope is less than 1 percent, out-of-bank flow may be permitted if such flow will not cause excessive erosion. The minimum in such cases shall be the capacity required to remove the water before crops are damaged.

Velocity. Design velocities shall not exceed those obtained by using the procedures, “n” values, and recommendations in the NRCS Engineering Field Handbook (EFH) Part 650, Chapter 7, or Agricultural Research Service (ARS) Agricultural Handbook 667, Stability Design of Grass-lined Open Channels, or SCS-TP-61, Handbook of Channel Design for Soil and Water Conservation.

Width. The bottom width of trapezoidal waterways shall not exceed 100 feet unless multiple or divided waterways or other means are provided to control meandering of low flows.

Side slopes. Side slopes shall not be steeper than a ratio of two horizontal to one vertical. They shall be designed to accommodate the equipment anticipated to be used for maintenance and tillage/harvesting equipment that will cross the waterway.

Depth. The minimum depth of a waterway that receives water from terraces, diversions, or other tributary channels shall be that required to keep the design water surface elevation at or below the design water surface elevation in the terrace, diversion, or other tributary channel, at their junction when both are flowing at design depth.

Freeboard above the designed depth shall be provided when flow must be contained to prevent damage. Freeboard shall be provided above the designed depth when the vegetation has the maximum expected retardance.

Drainage. Designs for sites having prolonged flows, a high water table, or seepage problems shall include Subsurface Drains (Standard 606),

Underground Outlets (Standard 620), Stone Center Waterways or other suitable measures to avoid saturated conditions.

Outlets. All grassed waterways shall have stable outlets with adequate capacity to prevent ponding or flooding damages. The outlet can be another vegetated channel, an earthen ditch, a grade-stabilization structure, filter strip or other suitable outlet.

Stone Center Waterways. In areas where field stone or other rock sources are available, a stone center may assist in establishment of the waterway and solve prolonged flows and wetness problems. A gravel bedding or geotextile fabric should be used under the rock to prevent erosion of the soil. The stone center portion shall carry the one-year, 24-hour duration peak discharge or the maximum permissible velocity may be increased by one (1) foot-per-second. Installation shall follow Figure 7-5 and stone size shall be determined from Exhibit 7-6 in NRCS Engineering Field Handbook (EFH), Part 650, Chapter 7.

Natural Waterways. Natural grassed waterways (plow skips and swales) meet this standard when the following conditions are met:

1. Permanent vegetation has been established and there is no rilling in the waterway.
2. Runoff is able to enter the waterway along the entire length (no plowing parallel to the centerline of the waterway).
3. A minimum width of 20 feet and a maximum width of 50 feet is maintained with a maximum depth of 1.0 foot and a minimum depth of 0.4 foot.
4. The waterway is not used for an outlet for a diversion or terrace, unless capacity and stability are checked and adequate.

Erosion Control Mat. Geo-synthetic three-dimensional erosion control mats manufactured for the purpose may be used to stabilize waterways. The design velocity may be increased to the manufacturer's recommendations.

Vegetative Establishment. Grassed waterways shall be vegetated according to Standard 342, Critical Area Planting, or the current Penn State publication "Erosion Control and Conservation Planting on Noncropland."

Seedbed preparation, time of seeding, mixture rate, stabilizing crop, mulching, or mechanical means of stabilizing, fertilizer, and lime requirements shall be specified for each applicable area.

Establish vegetation as soon as conditions permit. Specify mulch anchoring, nurse crop, rock, straw or hay bale dikes, filter fences, or runoff diversion to protect the vegetation until it is established.

CONSIDERATIONS

Important wildlife habitat, such as woody cover or wetlands, should be avoided or protected if possible when siting the grassed waterway. If trees and shrubs are incorporated, they should be retained or planted in the periphery of grassed waterways so they do not interfere with hydraulic functions. Mid- or tall bunch grasses and perennial forbs may also be planted along waterway margins to improve wildlife habitat. Waterways with these wildlife features are more beneficial when connecting other habitat types; e.g., riparian areas, wooded tracts and wetlands.

Water-tolerant vegetation such as reed canarygrass may be an alternative on some wet sites.

Use irrigation on dry sites or during dry weather as necessary to promote germination and vegetation establishment.

Provide livestock and vehicular crossings as necessary to prevent damage to the waterway and its vegetation.

Filter Strips (Standard 393) may be established on each side of the waterway to improve water quality.

Add width of appropriate vegetation to the sides of the waterway for wildlife habitat.

PLANS AND SPECIFICATIONS

Plans and specifications for grassed waterways shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose(s).

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be provided to and reviewed with the landowner. The plan shall include the following items and others as appropriate.

A maintenance program shall be established to maintain waterway capacity, vegetative cover, and outlet stability. Vegetation damaged by machinery, herbicides, or erosion must be repaired promptly.

Seeding shall be protected from concentrated flow and grazing until vegetation is established.

Minimize damage to vegetation by excluding livestock whenever possible, especially during wet periods.

Inspect grassed waterways regularly, especially following heavy rains. Damaged areas will be filled, compacted, and seeded immediately. Remove sediment deposits to maintain capacity of grassed waterway.

Landowners should be advised to avoid areas where forbs have been established when applying herbicides.

Avoid using waterways as turn-rows during tillage and cultivation operations. Do not use as a field road. Avoid crossing with heavy equipment when wet.

Prescribed burning and mowing may be appropriate to enhance wildlife values, but should be conducted to avoid peak nesting seasons and reduced winter cover.

Mow or periodically graze vegetation to maintain capacity and reduce sediment deposition.

Control noxious weeds.

REFERENCES

1. NRCS Engineering Field Handbook (EFH) Part 650, Chapters 7 and 9.
2. SCS-TP-61, Handbook of Channel Design for Soil and Water Conservation.
3. Penn State "Erosion Control and Conservation Planting on Noncropland."
4. Agricultural Research Service (ARS) Agricultural Handbook 667, "Stability Design of Grass-lined Open Channels."